REMARKS

Summary of Amendments

Claims 1 through 5 are pending in this application. Claims 1 and 5 have been amended to include limitations as to dynamic-pressure-generating grooves that are axially unbalanced such that the pressure generated in the oil by the lone bearing is heightened in the direction heading toward the base of the conical bearing cavity. Claims 1 and 5 have also been amended to include hub, rotor magnet, and stator limitations.

In addition, new claims 6 through 12 have been submitted. New independent claim 6 corresponds in subject matter to claims 1 and 5 as amended, but is written to cover the embodiments of Figs. 3 and 4 in the present specification. New independent claims 10 through 12 correspond in subject matter respectively to claims 1 and 5 as amended and new claim 6, but further recite the limitation that the frustum height of the conic frustum portion of the shaft is "is less than one-half the radius of said annular rotor magnet."

Claim Rejections - 35 U.S.C. § 103

Claims 1-5; Japanese Ref. No. '886 in view of Ichiyama '080

Claims 1through 5 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Japanese Pub. Pat. App. No. H07-007886 by Takasu in view of U.S. Pat. No. 5,658,080 by Ichiyama.

Section 2. of the present Office action maintains that the '886 reference teaches a spindle motor having "one dynamic-pressure bearing (A) formed in said gap, between the lateral surface of said cone portion and the inner peripheral surface of said conical cavity opposing the lateral surface." However, this would appear to result from a mistake originating in a mistranslation of the Japanese gazette publication. Although "*a* dynamic pressure bearing *A*" is mentioned in the English abstract, and "dynamic pressure bearing *A*" is mentioned in two instances in the computer-generated English rendering of the description (in the other instances, the bearing is referred to together with auxiliary thrust bearing *B*—i.e., "dynamic pressure bearings *A* and *B*"), in the corresponding original, there is no statement signifying that the dynamic-pressure bearing is one (singular). Neither is anything that would suggest as much set forth in the figures.

Rather, two axially separated dynamic-pressure bearings on the side face of the conical part are clearly depicted in Figs. 1 and 4 of the cited reference. This is also described unambiguously in paragraph [0013], which states, "In the motor of the present embodiment, a plurality of sets (two sets in the illustrated embodiment) of scored grooves 33 spaced apart in the vertical direction is formed on the outer peripheral sloping-face portion of the rotary shaft part 21." Accordingly, although under "Purpose," the English abstract written by Patent Abstracts of Japan (PAJ) for the '886 reference mentions "reduce[ing] the height of a motor

by forming U-shaped grooves on . . . a hydrodynamic bearing section .. . . thereby providing a bearing function both in the radial and thrust directions by means of a single hydrodynamic bearing," nowhere in the Japanese original is "a single hydrodynamic bearing"—in particular, configured by a single set of dynamic-pressure-generating grooves—taught or suggested.

As now recited in amended claims 1 and 5, the present invention in contrast provides for

> one and only one dynamic-pressure bearing . . . including, on at least either said lateral surface of said cone portion or said inner peripheral surface of said conical cavity, grooves *provided in one and only one set unbroken axially* and in unbalanced herringbone or spiral form, configured so as to heighten pressure heading toward the base of said conical cavity.

A plurality of dynamic-pressure bearings ordinarily is formed on the side face of the shaft in fluid dynamic-pressure bearing mechanisms. A drawing that plainly depicts two dynamic-pressure bearings separated in the axial direction, insofar as it does not allow otherwise, should be regarded as *not* showing a bearing mechanism in which only a single dynamic-pressure bearing is formed.

In contrast, a spindle motor of the present invention is lent a configuration in which, in addition the shaft being conical in form, the dynamic-pressure bearing is one and only one. The present invention in terms of the bearing is based on new knowledge that, while venturing thus to simplify, works to stabilize the bearing. A teaching or suggestion that such simplification is possible is absent from the cited references. Nor is any mention made concerning the aspect of the present invention that thus simplifying the dynamic-pressure bearing configuration in a spindle motor realizes a reduction in the power that the motor consumes, as explained in paragraph [0018] of the present specification.

For the foregoing reasons, it would seem that there are no grounds for the assertion that on the basis of JP 07-007886 one may readily arrived at the present invention.

The first paragraph on page 3 of the present Office action states that the JP 07-007886 reference "fails to disclose the oil filing a clearance, including the approximately uniform gap, between said cone portion and said conical cavity, wherein said oil is retained continuously without interruption." Then based on the sentence following the initial paragraph on page 3, it would appear that Ichiyama '080 has been cited for "teach[ing] the use of oil for lubrication purposes."

Although not included in the PAJ version of the abstract, the Japanese original abstract at the end states, "A lubricant is filled into these grooves." And the lubricant is mentioned throughout the description—even the machine-translated text provided by the examiner reads in paragraph [0003] for example, "the lubricant with which a part for a slot is filled up," with "slot" here meaning the dynamic-pressure-bearing grooves. It is respectfully

submitted that a person skilled in the art would not need to turn from the JP 07-007886 reference to the Ichiyama patent in order to find a suggestion to use oil as the lubricant in the motor configuration taught by Takasu in the JP 07-007886 reference, inasmuch as Takasu '886 stating that "the grooves are filled with lubricant" would be understood to mean that the lubricant could very well be oil. Applicant acquiesces in this, in particular because the non-obviousness of the present invention does not lie in the use itself of oil as a lubricant in the dynamic-pressure bearing taught by the present specification. (Note that the PAJ abstract uses the term *hydro*dynamic bearing, although only the term "dynamic-pressure bearing" is used in the Japanese original.)

Even were a person skilled in the art motivated to turn to the teaching of Ichiyama '080, that person would not otherwise find a teaching or suggestion, either alone or in combination with the JP 07-007886 reference, to lead that person to a spindle motor as taught by the present invention.

In particular, Figs. 2, 3 and 4 of the '080 patent disclose dynamic-pressure bearing taper-seal structures for hydrodynamic bearings. In the region of 32 in Fig. 2, the opening on the tapered portion is oriented radially inward, and the meniscus is oriented radially inward as well. Limited to this one respect, the '080 patent resembles the configuration of the present invention. Nevertheless, no mention is in any way made of supporting a shaft with a lone dynamic pressure bearing, which is a most important feature of the present invention. Therefore, to come up with the inventive configuration in the present application from any reading of the '080 patent would be improbable.

Although not referred to in making the claim rejections in the Detailed Action section of the present Office action, among the literature entered in Form PTO-892, "Notice of References Cited," reference itemized "C" and, within reference itemized "F," a reference (F' hereinafter) referred to as a preceding instance, will be discussed in the following, because Applicant in evaluating any potential materiality to the patentability of the pending claims has deemed it necessary to clarify differences between these references and the present invention.

Reference *C*: US 3,591,817

A configuration having a shaft possessing a conically shaped outer peripheral face and a hollow area where the conical section of the shaft is accommodated in the sleeve, and in which the conically shaped outer peripheral face and the inner periphery of the sleeve form a single conical bearing whereby the shaft is supported, is disclosed in the cited reference.

Nevertheless, the bearing disclosed in the cited reference is predicated on air as the lubricant fluid. The bearing-surface groove structure is also predicated on lubrication by means of air; the groove structure is completely different from the dynamic-pressure grooves of the present invention.

If with respect to the bearing structure disclosed in the cited reference the lubricant fluid were switched to oil, and further, the grooves were changed to herringbone- or spiral-shaped, whether the bearing would operate normally could not be readily determined even by a person skilled in the art.

What is more, the bearing in the cited reference lacks a magnetic biasing means that resists the supporting force of the bearing. A structure by which a magnetic bias could be assumed to be operating is, moreover, not set forth in the spindle motor disclosed in Figs. 1 and 3.

Reference *F*: JP 60-208629-A (cited as prior art in US 6,127,756)

A motor having a magnetic bearing mechanism for magnetically lifting the rotary part, and a dynamic-pressure bearing mechanism made by fitting a sleeve having a conically shaped through-hole over a conic frustum-shaped stationary shaft is disclosed in this reference. Again the lubricant fluid is, as a precondition, air.

With the present invention, while the shaft is accommodated in the conical cavity, there is no through-hole. Moreover, a magnetic bearing mechanism that by the agency of magnetism puts lift on the rotary part is not a necessity. Oil, which totally differs from air in compressive and viscous properties, is used as the lubricant fluid. The present invention differs from the cited reference in these respects.

To depart from the cited reference and arrive conceptually at a configuration according to the present invention would require modifications that would involve closing over the bottom area of the through-hole and further, changing the lubricant fluid to oil, and further still, omitting the magnetic bearing mechanism. Over and above such drastic alterations, whether or not the configuration would operate normally as a bearing could not be readily determined by even a person said to be skilled in the art.

Regarding Cited References in Combination

Whether or not the configuration according to the present invention could be derived by combining the four references referred to in the foregoing will now be examined.

A feature of the present invention as recited in claim 1 is "one and only one dynamic-pressure bearing" for supporting the shaft, including dynamic-pressure-generating grooves formed on at least either the lateral surface of the shaft cone portion or on the inner peripheral surface of the conical cavity.

Of the two references cited in the Office action in rejecting original claims 1 through 5, and the two references *C* and *F'* discussed above, only these latter two are provided with an analogous feature.

Of the latter two, the structure of the dynamic-pressure grooves in reference *F'* has a herringbone form, as is the case with the present invention. Nevertheless, the lubricant fluid is predicated to be air, and besides, the reference *F'* teaching requires a magnetic bearing mechanism for generating lift on the rotary section. Furthermore, the sleeve side of the dynamic-pressure bearing is perforated by a hole.

The configuration taught by reference *C* on the other hand does not possess magnetic bearing mechanism, and supports the shaft with only a conical bearing mechanism. Nevertheless, the lubricant fluid is air. The groove formation in the bearing face is especially premised on air, and the bearing configuration has holes piercing the sleeve to an interior portion of the grooves, so that during rotation air is drawn into the bearing via the holes.

In sum, although references *C* and *F'* teach a only one dynamic-pressure bearing on a single conical surface, in either case the gap between the shaft and the sleeve communicates with the lower side of the sleeve, meaning that each teaches a structure in which air enters/exits through the lower side.

In other words, as a structure for supporting the shaft with only one dynamic-pressure bearing formed on a conical face, a structure in which the sleeve base area is not connected to the air is neither taught nor suggested in either the *C* or the *F'* reference. Therefore, a configuration according to the present invention could not be obtained merely by combining the *C* and *F'* references.

Moreover, based on such structures as taught in the *C* and *F'* references, were a structure in which the lubricant fluid is switched from air to oil investigated, converting a motor into a structure in which the sleeve bottom area is shielded and closed off from the air would not be obvious.

This is because among dynamic-pressure bearings in which the lubricant fluid is oil are both structures in which the sleeve bottom area is connected to the air, and structures in which it is not. Besides, closing off the bottom area brings with it the drawback of complicating the oil-charging process.

If a structure in which the bottom area is connected to the air is adopted as the foundational structure along with switching the lubricant fluid to oil, deliberately selecting a structure in which the bottom area is closed off would not be inevitable.

In the present invention set forth in the present application, the knowledge that if oil is to be made the lubricant fluid, then it is desirable to render the motor structure one in which the bottom area is closed off was obtained, which completed the invention. 35 U.S.C. § 103(a) thus should not apply here.

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Accordingly, Applicant courteously urges that this application is in condition for allowance. Reconsideration and withdrawal of the rejections is requested. Favorable action by the Examiner at an early date is solicited.

Respectfully submitted,

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